

WHAT IS CLAIMED IS:

1. A data transmission apparatus for generating a transmission signal corresponding to data to be processed based  
5 on a predetermined communication protocol, and transmitting/receiving the transmission signal, the apparatus comprising:

a processing unit for processing transmission/reception data based on the communication protocol;

10 a transmitting/receiving unit for generating a transmission signal based on the transmission data processed by the processing unit and outputting the resultant signal, and generating reception data based on a transmission signal output from other data transmission apparatus and outputting the resultant  
15 data to the processing unit;

transmitting/receiving unit initialization means for initializing the transmitting/receiving unit so that the transmitting/receiving unit is operable to perform transmission/reception with other transmitting/receiving units  
20 of other data transmission apparatuses; and

processing unit initialization means for initializing the processing unit so that the processing unit is operable to perform data communication with other processing units of other data transmission apparatuses via the transmitting/receiving unit  
25 after the transmitting/receiving unit initialization means

initializes the transmitting/receiving unit.

2. The data transmission apparatus according to claim 1,  
wherein the transmitting/receiving unit initialization means  
5 initializes the transmitting/receiving unit by establishing clock  
synchronization between the transmitting/receiving unit and other  
transmitting/receiving units of other data transmission  
apparatuses.

10 3. The data transmission apparatus according to claim 2,  
wherein

the transmitting/receiving unit initialization means  
includes clock synchronization establishment notification means  
for notifying the processing unit initialization means of  
15 establishment of clock synchronization when the clock  
synchronization is established, and

the processing unit initialization means starts  
initialization, in response to clock synchronization  
establishment notification made by the clock synchronization  
20 establishment notification means, by which the processing unit  
is operable to perform data communication with other processing  
units of other data transmission apparatuses via the  
transmitting/receiving unit.

25 4. The data transmission apparatus according to claim 3,

wherein

if no clock synchronization establishment notification is made by the clock synchronization establishment notification means within a predetermined time, the processing unit  
5 initialization means starts initialization so that the processing unit is operable to perform data communication with other processing units of other data transmission apparatuses via the transmitting/receiving unit,

the processing unit initialization means further  
10 includes communication anomaly detection means for detecting anomalies of data communication during the started initialization, and

when the communication anomaly detection means detects the anomalies, the transmitting/receiving unit initialization  
15 means re-performs initialization by which clock synchronization is established between the transmitting/receiving unit and other transmitting/receiving units of other data transmission apparatuses.

20 5. The data transmission apparatus according to claim 1, wherein

the transmitting/receiving unit generates the transmission signal by mapping the transmission data to any of a plurality of signal levels, and

25 the transmitting/receiving unit initialization means

performs initialization by causing the transmitting/receiving unit:

to transmit an initialization signal for identifying the signal levels to other data transmission apparatuses; and

5 to receive an initialization signal transmitted from other data transmission apparatus, and set evaluation levels for identifying a signal level of the transmission signal using the initialization signal.

10 6. The data transmission apparatus according to claim 5, wherein

the transmitting/receiving unit initialization means includes evaluation level setting completion notification means for notifying the processing unit initialization means of completion of setting of evaluation levels when the evaluation levels are set, and

15 the processing unit initialization means starts initialization, in response to notification of a completion of evaluation level setting made by the evaluation level setting completion notification means, by which the processing unit is operable to perform data communication with other processing units of other data transmission apparatuses via the transmitting/receiving unit.

25 7. The data transmission apparatus according to claim 6,

wherein

if no notification of a completion of evaluation level setting is made by the evaluation level setting completion notification means within a predetermined time, the processing  
5 unit initialization means starts initialization so that the processing unit is operable to perform data communication with other processing units of other data transmission apparatuses via the transmitting/receiving unit,

the processing unit initialization means further  
10 includes communication anomaly detection means for detecting anomalies of data communication during the started initialization, and

when the communication anomaly detection means detects the anomalies, the transmitting/receiving unit initialization  
15 means re-performs initialization for setting the evaluation levels.

8. The data transmission apparatus according to claim 1, wherein the communication protocol used by the processing unit  
20 is defined by MOST (Media Oriented Systems Transport).

9. The data transmission apparatus according to claim 1 further comprising a radiator for outputting a reference frequency, wherein

25 the processing unit and the transmitting/receiving unit

separately include a phase lock loop for performing a process by establishing clock synchronization, and

each phase lock loop included in the processing unit and the transmitting/receiving unit uses the reference frequency  
5 output from the radiator.

10. A data transmission system including a plurality of data transmission apparatuses connected in a ring topology via a transmission path, by which the data transmission apparatuses  
10 perform unidirectional communication with each other, wherein

each data transmission apparatus includes:

a processing unit for processing transmission/reception data based on a predetermined communication protocol;

15 a transmitting/receiving unit for generating a transmission signal based on the transmission data processed by the processing unit and outputting the resultant signal to other data transmission apparatus connected to a next stage, and generating reception data based on a transmission signal output  
20 from other data transmission apparatus connected to a previous stage and outputting the resultant data to the processing unit;

transmitting/receiving unit initialization means for initializing the transmitting/receiving unit so that the transmitting/receiving unit is operable to perform  
25 transmission/reception with other transmitting/receiving units

of other data transmission apparatuses; and

processing unit initialization means for  
initializing the processing unit so that the processing unit is  
operable to perform data communication with other processing units  
5 of other data transmission apparatuses via the  
transmitting/receiving unit after the transmitting/receiving  
unit initialization means initializes the transmitting/receiving  
unit.

10 11. The data transmission system according to claim 10,  
wherein the transmitting/receiving unit initialization means  
initializes the transmitting/receiving unit by establishing clock  
synchronization between the transmitting/receiving unit and other  
transmitting/receiving units of other data transmission  
15 apparatuses.

12. The data transmission system according to claim 11,  
wherein

the transmitting/receiving unit initialization means  
20 includes clock synchronization establishment notification means  
for notifying the processing unit initialization means of  
establishment of clock synchronization when the clock  
synchronization is established, and

the processing unit initialization means starts  
25 initialization, in response to clock synchronization

establishment notification made by the clock synchronization establishment notification means, by which the processing unit is operable to perform data communication with other processing units of other data transmission apparatuses via the transmitting/receiving unit.

13. The data transmission system according to claim 12, wherein

if no clock synchronization establishment notification is made by the clock synchronization establishment notification means within a predetermined time, the processing unit initialization means starts initialization so that the processing unit is operable to perform data communication with other processing units of other data transmission apparatuses via the transmitting/receiving unit,

the processing unit initialization means further includes communication anomaly detection means for detecting anomalies of data communication during the started initialization, and

when the communication anomaly detection means detects the anomalies, the transmitting/receiving unit initialization means re-performs initialization by which clock synchronization is established between the transmitting/receiving unit and other transmitting/receiving units of other data transmission apparatuses.



14. The data transmission system according to claim 10,  
wherein

the transmitting/receiving unit generates the  
5 transmission signal by mapping the transmission data to any of  
a plurality of signal levels, and

the transmitting/receiving unit initialization means  
performs initialization by causing the transmitting/receiving  
unit:

10 to transmit an initialization signal for identifying  
the signal levels to other data transmission apparatuses connected  
to a next stage; and

to receive an initialization signal transmitted from  
other data transmission apparatus connected to a previous stage,  
15 and set evaluation levels for identifying a signal level of the  
transmission signal using the initialization signal.

15. The data transmission system according to claim 14,  
wherein

20 the transmitting/receiving unit initialization means  
includes evaluation level setting completion notification means  
for notifying the processing unit initialization means of  
completion of setting of evaluation levels when the evaluation  
levels are set, and

25 the processing unit initialization means starts

initialization, in response to notification of a completion of evaluation level setting made by the evaluation level setting completion notification means by which the processing unit is operable to perform data communication with other processing units of other data transmission apparatuses via the transmitting/receiving unit.

16. The data transmission system according to claim 15, wherein

10 if no notification of a completion of evaluation level setting is made by the evaluation level setting completion notification means within a predetermined time, the processing unit initialization means starts initialization so that the processing unit is operable to perform data communication with other processing units of other data transmission apparatuses via the transmitting/receiving unit,

the processing unit initialization means further includes communication anomaly detection means for detecting anomalies of data communication during the started initialization, and

20 when the communication anomaly detection means detects the anomalies, the transmitting/receiving unit initialization means re-performs initialization for setting the evaluation levels.

17. The data transmission system according to claim 10, wherein the communication protocol used by the processing unit is defined by MOST (Media Oriented Systems Transport).

5 18. The data transmission system according to claim 10, wherein

each data transmission apparatus further includes a radiator for outputting a reference frequency,

the processing unit and the transmitting/receiving unit  
10 separately include a phase lock loop for performing a process by establishing clock synchronization, and

each phase lock loop included in the processing unit and the transmitting/receiving unit uses the reference frequency output from the radiator.

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19. An initialization method for initializing a data transmission apparatus generating a transmission signal corresponding to data to be processed based on a predetermined communication protocol, and transmitting/receiving the  
20 transmission signal to/from other data transmission apparatus, wherein

a physical layer, which generates a transmission signal corresponding to transmission data processed based on the communication protocol and transmits the resultant signal, and  
25 generates reception data based on a transmission signal output

from other data transmission apparatus, and other physical layers of other data transmission apparatuses are initialized so as to be operable to transmit/receive the transmission signal, and  
after initialization of the physical layers, a link layer,  
5 which processes the transmission data and the reception data based on the communication protocol, and other link layers of other data transmission apparatuses are initialized so as to be operable to perform data communication via the physical layers.

10 20. The initialization method according to claim 19, wherein initialization of the physical layer is performed by establishing clock synchronization between the physical layer and other physical layers of other data transmission apparatuses.

15 21. The initialization method according to claim 20, wherein

when the clock synchronization is established in initialization of the physical layer, establishment of the clock synchronization is notified, and

20 in response to notification of establishment of the clock synchronization, initialization is started so that the link layer and other link layers of other data transmission apparatuses are operable to perform data communication via the physical layer.

25 22. The initialization method according to claim 21,

wherein

if no notification of establishment of the clock  
synchronization is made within a predetermined time,  
initialization is started so that the link layer and other link  
5 layers of other data transmission apparatuses are operable to  
perform data communication via the physical layer, and

when anomalies of data communication are detected during  
the started initialization, initialization for establishing clock  
synchronization between the physical layer and other physical  
10 layers of other data transmission apparatuses is re-performed.

23. The initialization method according to claim 19,  
wherein

the transmission signal is generated from the  
15 transmission data which is mapped to any of a plurality of signal  
levels by the physical layer, and

initialization of the physical layer is performed by:  
transmitting an initialization signal for  
identifying the signal levels, from the physical layer to other  
20 data transmission apparatuses; and

setting evaluation levels for identifying a signal  
level of the transmission signal using an initialization signal  
after the physical layer receives the initialization signal  
transmitted from other data transmission apparatus.

24. The initialization method according to claim 23,  
wherein

in the initialization of the physical layer,  
notification of a completion of evaluation level setting is made  
5 when the evaluation levels are set, and

in response to notification of a completion of evaluation  
level setting, initialization by which the link layer and other  
link layers of other data transmission apparatuses are operable  
to perform data communication via the physical layer is started.  
10

25. The initialization method according to claim 24,  
wherein

if no notification of a completion of evaluation level  
setting is made within a predetermined time, initialization is  
15 started so that the link layer and other link layers of other data  
transmission apparatuses are operable to perform data  
communication via the physical layer, and

when anomalies of data communication are detected during  
the started initialization, initialization for setting the  
20 evaluation levels is re-performed.

26. The initialization method according to claim 19,  
wherein the communication protocol is defined by MOST (Media  
Oriented Systems Transport).